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► To cite this version:

Hicham Ezzat, Pascal Le Masson, Benoit Weil. Extending lab results to advices for leadership facilitating creativity in organizations. CERN IdeaSquare Journal of Experimental Innovation, 2017, 1 (2), pp.17-27. 10.23726/cij.2017.481 . hal-01674313

HAL Id: hal-01674313

<https://hal.science/hal-01674313v1>

Submitted on 2 Jan 2018

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Extending lab results to advices for leadership facilitating creativity in organizations

Hicham Ezzat^{1*}, Pascal Le Masson¹ and Benoit Weil¹

¹Center for Management Sciences, MINES ParisTech– PSL Research University, Paris, France

*Corresponding author: hicham.ezzat@mines-paristech.fr

ABSTRACT

In today's innovation-dependent environment, organizations should constantly innovate to survive in the marketplace. However, fixation imposes major constraints on the creativity of employees in organizations. In recent years, experimental laboratory studies have proposed leadership-based methods to overcome fixation. In this study, we propose and test a research method that extends the results of these studies to organizations and demonstrate how this can help uncover new organizational leadership variables promoting creativity that are not usually considered in the literature. We use a set of historical and empirical material to validate the importance of including these criteria when studying "leadership for creativity."

Keywords: leadership, creativity, fixation, laboratory, organization.

Received: August 2017. Accepted: December 2017.

INTRODUCTION

Leadership has long been recognized as playing a crucial role in fostering creativity in organizations (Mumford, et al., 2002, 2007, Puccio et al., 2010, Reiter-Palmon and Illies, 2004, Rickards and Moger, 2000, Sternberg et al., 2003, Stoll and Temperley, 2009). Recent laboratory experiments have shown that leaders can play a pivotal role in fostering creativity among their teams by overcoming fixation (defixation) (Ezzat et al., 2016a, 2017a, 2017b, Camarda et al., 2017, Brun et al., 2015).

Fixation – described as a "cognitive bias (mental block) against using an object in a new way that is required to solve a problem" (Jansson and Smith, 1991, Duncker and Lees, 1945) – is no doubt considered a major hindrance to employees' creative thinking in organizations, constraining their ability to come up with innovative ideas, generate alternative solutions to problems, or discard old existing paradigms (Stempfle, 2011).

Hence, our research question is how can these experimental results be transferred to organizations? In other words, how can one rely on lab experiments to gain knowledge on the role of "leadership for creativity" in organizations?

The issue can be illustrated more precisely as follows. In recent years, we have undertaken lab experiments in which a "leader" gives instructions to an "ideator" in charge of "proposing as many original solutions to ensure a hen's egg dropped from ten meters does not break" (Ezzat et al., 2017a, Ezzat et al., 2016b, Ezzat et al.,

2017c). Based on these lab experiments, we have shown that if leaders follow specific rules, such as providing ideators with certain types of instructions in particular situations, they can help ideators to "defixate", and consequently generate creative ideas. We designated these experimental rules as "cognitive rules of leadership for creativity".

To translate this into an organizational context, one could simply construct a straightforward analogy and consider specific organizational situations in which managers provide instructions to one of their team members in charge of proposing ideas for a particular innovation project. Nevertheless, this situation only reflects a very narrow subset of all the situations in which leaders can support their teams to defixate. For instance, leaders could act at many different stages of the innovation process, not just in the initial phase of ideation or in relation to a single innovation issue. Moreover, their actions could take various forms such as organizing work division, defining incentives, providing strategic orientation, organizing professional education and learning, and entering into contracts with external partners.

Does this mean that the "cognitive rules of leadership for creativity" obtained in the lab experiments are meaningless in all the above-mentioned situations? No, it does not. However, the significance of these rules should be appropriately underscored in relation to a variety of organizational situations. This is the issue we address in this study.

METHODOLOGICAL ISSUES: LEARNING FROM LAB EXPERIMENTS IN MANAGEMENT SCIENCE

Today, there is a growing debate about the role of lab experiments in management research (Christiansen and Birkinshaw, 2017, Mäkinen et al., 2015). True organizational experiments are difficult to implement in the field of management science because researchers do not always have full control over the situation (Johnson and Duberley, 2000). However, there is a tradition of laboratory experiments in other fields such as marketing or behavioural decision science (Perdue and Summers, 1986, Sterman, 1989). In these fields, lab experiments are possible because there are relatively few parameters needing to be controlled to obtain valid results. Many researchers rightly advocate for real-life experiments as a way to explore the creation of new knowledge in organizations. Indeed, lab experiments are unable to take into account the multiple variables relating to organizational life. When confronting this issue, researchers stress that there are actually two distinct cases (Shani, 2007, David and Hatchuel, 2007). In the first case, the theoretical model is quite complex but complete – i.e. one knows all the relevant variables (dependent, independent, control) in the model. Accordingly, one chooses real-life experiments since lab experiments are unable to take all these variables into account. In the second case, one does not know all the variables, and thus real-life experiments might help to reveal “hidden” variables. The study of “leadership for creativity” in organizations involves the second case: one may be aware of some of the relevant variables, but will not have a complete list of all possible variables.

In the case where the model is incomplete and some variables (or interactions between them) are yet to be discovered, i.e. similar to “discovery research” epistemological works (see for example the work of Varenne (2009)), real-life experiments are not the only possible form of experiment. Specifically, if one knows that there is a critical phenomenon that is not completely understood (such as fixation), and that is difficult to observe in real life, it might be acceptable to “isolate” the phenomenon to study it in depth. In this case, lab experiments are extremely useful. This is the approach used in particle physics at CERN: one designs lab experiments to explore particular phenomena.

In recent years, a series of experiments has shown that cognitive phenomena such as fixation effects play a critical role in creativity, and most importantly that leaders can play a crucial role in manipulating these cognitive phenomena among followers (Ezzat et al., 2016b, 2017a, 2017b, 2017c). Theoretically, this cognitive role of leadership might be strong enough to explain some inconclusive results. For instance, provision of incentives might be a leadership variable influencing creativity. However, some studies show that incentives can positively influence creativity (Azoulay et al., 2011),

while others show the opposite (Kounios and Beeman, 2015). Formal models of cognitive fixation might explain this inconclusiveness by explaining that incentives can entail a fixation instruction (“you will be rewarded if you build a profitable business”) or a defixation one (“you will be rewarded if your idea is different from all the ideas that are presented by other people”).

Hence, cognition is a critical variable that might explain these inconclusive results. However, the cognitive variable is very difficult to control because there are no clear “cognitive rules of leadership for creativity”. Thus, the first methodological choice is to rely on lab experiments to identify and test specific “cognitive rules of leadership for creativity”. Note that this step is just one of the many ways to produce scientific knowledge. Several teams have actually studied various facets of the cognition of creativity through lab experiments (Smith and Linsey, 2011, Crilly and Cardoso, 2017), and more specifically we have designed a series of lab experiments to identify and test leadership-based cognitive rules for creativity (Ezzat et al., 2016b, 2017a, 2017b, 2017c).

However, this lab experimental phase is insufficient because one still needs to study what happens in organizational contexts with multiple variables. Nonetheless, since we are involved in a discovery process, the aim is to *understand what the critical variables might be, given that the cognitive rules of leadership for creativity are known*. In other words, the challenge is not to estimate the parameters of complex models, but rather to build a list of variables that should be integrated into a model before estimation, and thereby avoid omitting variables that might be critical. This is the core aim of our study: we want to use our obtained rules to uncover new organizational variables. Therefore, we propose and illustrate a way to make use of the knowledge gained in lab experiments to obtain results in complex organizational settings.

Research methodology to translate lab results to organizations

We first identify “cognitive rules of leadership for creativity” based on our lab experiments (step 2). These rules are basic contingent strategies that can be used by leaders to defixate ideators in situations of creative ideation.

We then extend these rules to organizational contexts (step 3). Our method is as follows. Based on a thorough review of studies related to “leadership for creativity” published in *The Leadership Quarterly* from 2002 to 2010 (Mumford et al., 2002, Reiter-Palmon and Illies, 2004, Shalley and Gilson, 2004, Makri and Scandura, 2010), we identified an initial list of “observed variables” used to analyse “leadership for creativity” including *team diversity, sufficient resources and time, constructive evaluation, collective decision-making, setting creativity as a goal, a creativity-supportive climate* and *intrinsic motivation* (a detailed list of these variables is presented in the following sections).

We then clustered this list into the following seven leadership archetypes: *recruiter, resources and time allocator, evaluator, decision-maker, goal-setter, climate creator* and *motivator*. The parameters related to these archetypes can be seen as “latent variables” that describe levers for the actions of leaders.

We then consider the cognitive rules of leadership for creativity and identify how each leader archetype can use its levers of action to follow these rules. This helps us to uncover new observed variables and analyse how they might play a crucial role in creativity such that they *cannot* be neglected. It is worth mentioning that in a discovery phase, we are not attempting to estimate the relative importance of all the new variables. Thus, our test is simple: it is sufficient to show at least one empirical case in which a leader for creativity used the new variable as a means of action. In this case, we should accept that this new variable has to be included in the list of relevant variables to study leadership for creativity in organizations. Hence, our result is a list of new, validated variables that can be used to study leadership for creativity in organizations.

To test whether a new variable is one that cannot be rejected, we rely on a set historical and empirical studies from various sources (mostly management and psychology) (see further Appendix A). These materials comprise monographs written by historians and management science researchers working on business history, in which there are detailed descriptions of how leaders act in situations of innovation. In the present study, we focused principally on five innovative leaders: Kenneth Mees (Kodak), David Kelley (IDEO), Steve Jobs (Apple) and Larry Page/Sergey Brin (Google). The table 1 below illustrates only one example of the historical material we used to analyse the innovative actions and behaviours of each of them in real situations of innovation.

Table 1. Example of historical material for famous leaders

Leader	One example of article to analyse famous leader's innovative actions/behaviour
Kenneth Mees (Kodak)	Le Guern, N., Contribution of the European Kodak research laboratories to innovation strategy at Eastman Kodak. 2017.
David Kelley (IDEO)	Kelley, D. and T. Kelley, Creative confidence: Unleashing the creative potential within us all. 2013: Crown Pub.
Steve Jobs (Apple)	Elliot, J. and W. Simon, The Steve Jobs way: iLeadership for a new generation. Vol. 33. 2011: Vanguard.
Larry Page/Sergey Brin (Google)	Vise, D., The Google story. Strategic Direction, 2007. 23(10).

Hence, the entire research method can be described as a three-step process (see Fig. 1). This method articulates the relationship between our leadership-based defixation studies (laboratory) (Ezzat et al., 2016b, 2017b, 2017c) and their implications for better understanding leaders' roles for creativity in the organizational context. This framework represents the guiding thread of this paper. In step 1, we discuss why experimental research procedures are indispensable to highlighting the hidden cognitive dimensions associated with fixation in organizations. In step 2, we present the “cognitive rules of leadership for

creativity” according to the lab experimental studies we have undertaken (Ezzat et al., 2016b, 2017b, 2017c). In step 3, which is the crucial step, we demonstrate how the rules of step 2 can shed light on new leadership variables in organizations. We conclude the paper with a discussion of our findings, conclusions, and suggestions for future experiments.

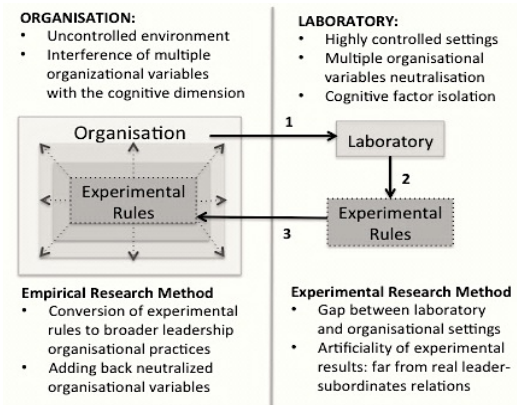


Fig. 1. A research method to highlight leadership for creativity in organizations using laboratory experiments

In the following sections, we will briefly explain steps 1 and 2 of this process. As noted above, these steps are not the core subject of this paper, and have already been described and validated in other publications. Consequently, in this paper we focus on step 3, i.e. how to use knowledge gained from lab experiments to produce knowledge for organizations.

STEP 1: ISSUES IN EXPERIMENTS EXAMINING LEADERSHIP FOR CREATIVITY IN ORGANIZATIONS

In step 1, we show that cognition – a critical phenomenon – might explain inconclusive results in the role of leadership for creativity. Here, we revisit existing results.

The empirical research method has ignored the cognitive dimension played by leaders in promoting creativity. Most creative leadership studies have focused on the social, rather than the cognitive perspective to study the role of leaders for creativity in organizational contexts (Mumford, 2002, Shalley and Gilson, 2004). The reason could be that uncovering the roles of leaders for creativity in uncontrolled environments such as organizations, where multiple variables (e.g. recruitment, motivation, climate, and evaluation) could interfere with the cognitive dimension, is not an easy task (see Fig. 2). To illustrate this fact, the creative leadership literature recognizes both transactional and transformational leadership as stimulators of creativity. Transactional leaders impact extrinsic motivation, whereas transformational leaders impact intrinsic motivation. According to the literature on creativity, both intrinsic and

extrinsic motivators are correlated with creativity (Amabile, 1997), and therefore enhance followers' capacity to generate creative ideas. However, few studies have examined how these two leadership styles cognitively affect creativity. In other words, very little is known about the impact of transformational or transactional leaders on fixation. Conversely, the literature on creative leadership argues that leaders can stimulate creativity among their followers by manipulating various social and contextual factors such as climate (Amabile, 1996), evaluation (Amabile, 1979), recruitment (Mumford, 2002), and resources (Drazin et al., 1999). Nevertheless, there are very few empirical studies that show how these social and contextual factors for creativity affect the cognitive factors for creativity. Indeed, there are no indications on how leaders could manage the fixation effects that occur during periods of creativity.

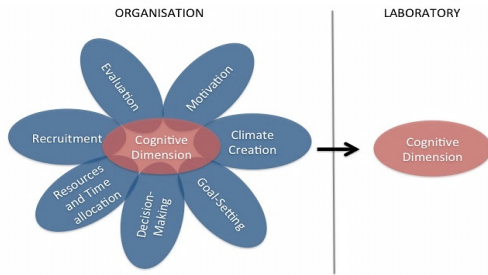


Fig. 2. Variables: organization versus laboratory

To overcome this difficulty, lab experiments are no doubt an efficient research method for studying these cognitive processes for creativity that are hidden among other organizational variables. Indeed, lab experiments can be undertaken under highly controlled settings, whereby most “interfering” organizational variables can be controlled and neutralized (Ezzat et al., 2017c). This neutralization can help to isolate the cognitive dimension and enable a detailed examination of the cognitive role of leaders for creativity. This is what we did in our experiments.

STEP 2: COGNITIVE RULES OF LEADERSHIP FOR CREATIVITY

In step 2, we conduct lab experiments to identify the “cognitive rules of leadership for creativity”.

In recent years, we have performed experimental studies that have enabled us to examine the cognitive role of leadership for creativity in depth, with figures of leaders that do not require very high levels of competencies. Table 2 summarizes our leadership-based defixation experiments in terms of levers for action and the competencies of the leaders, and their effects on fixation mitigation among ideators (i.e. the decrease in the rate of fixation compared with the control group).

Table 2. Lab experiments for leadership-based defixation

Laboratory Experiment	Leaders' Levers For Action	Leaders' Competencies	Fixation Mitigation (%)	Ref
Lab. Exp. 1	Initial Instructions	Abstract Knowledge of Fixation	Fixation reduced to 16%	Ezzat et al., 2016a, 2017a
Lab. Exp. 2	Repetitive Feedback	Minimal Knowledge	Fixation reduced to 2%	Ezzat, 2016c
Lab. Exp. 3	Directive Feedback	Perfect Recognition of Fixation	Fixation reduced to 47%	Ezzat, 2017b, 2016c
Lab. Exp. 4	Directive Feedback	Imperfect Recognition of Fixation	Fixation reduced to 11%	Ezzat et al., 2017c

These studies have shown that leadership strategies to defixate followers and make them more creative should follow these rules: i) leaders' analysis of the situation (A): detecting the current state of followers' (fixation “F” or expansion “E”) in relation to the project; and ii) leaders' action (B1/B2): maintaining individuals' inside expansion/deviation from the state of fixation (Ezzat et al., 2016b, 2017a, 2017b, 2017c) (see Fig. 3).

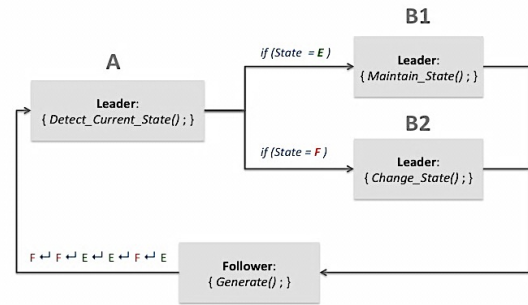


Fig. 3. Cognitive rules of leadership for creativity

STEP 3: HIGHLIGHTING ORGANIZATIONAL LEADERSHIP VARIABLES FOR CREATIVITY

It is worth pointing out that these rules might appear to be quite artificial, incompatible with real-world organizational contexts, and somewhat removed from actual leadership practices in organizations. The true value of these rules is only evident when they are applied to organizational contexts. However, simply validating these rules using empirical data (as happens in most studies under the umbrella of “managerial implications”) could be inaccurate, as stated earlier.

Extending fixation detection to “dominant design” recognition

Our experiments showed that leaders' capacity to detect what is inside and/or outside fixation is a crucial factor in facilitating creativity. Despite the fact that the definition of fixation could lead one to think that it is simply an individual tendency occurring in creative ideation, it is important to note that fixation is a broader concept that exists at the social and organizational levels (Stempfle, 2011). For example, some studies have

demonstrated that individuals can become fixated as a result of social factors such as exposure to the ideas of others during a brainstorming session (Kohn and Smith, 2011). Similarly, at the organizational level, employees can become fixated on their way of doing things, or on old, well-established paradigms (Stempfle, 2011).

However, in many organizations, leaders do not necessarily detect fixation, but rather can detect the “dominant design” (Hatchuel et al., 2001) of their current product, service or industry. The concept of “dominant design” introduced by Utterback and Abernathy (1975) is a new technology, product, or set of key features that becomes a de facto standard. When the dominant design is established, it becomes more “fixated” and difficult to change. Many empirical studies show that leaders who recognize the dominant design (when it exists) can make a big difference. For example, James Dyson was able to recognize the dominant design in the vacuum cleaner industry (which had not changed for several decades), and thereby led his team to design the first bagless vacuum cleaner in the latter half of the 1990s (Le Masson et al., 2010, Beverland and Farrelly, 2007).

On the contrary, the French public transport provider RATP considered the microbus project to be a failure at first because the leaders were unable to recognize the creative value behind the project (Elmqvist and Le Masson, 2009). Indeed, these leaders were fixated on the dominant design of the traditional means of public transport at the time. We can find further examples in the biographies of innovative leaders such as Steve Jobs, Thomas Edison, and Elon Musk, all of whom had the capacity to detect the dominant design of the project they were working on and, most importantly, undertook the necessary steps to break away from it.

Extending defixation actions to leadership archetypes in organizations

Similarly, in real-world organizational contexts, leaders not only provide their teams with instructions/feedback, but numerous means of actions can replace its roles. Therefore, to uncover new organizational leadership variables in accordance with the cognitive rules of leadership for creativity, we applied step 3.

Figure 4 illustrates the procedure for step 3. Leaders' actions are characterized by a set of well-known observed variables (O_i) that can in some way be “loaded” by associated latent variables (L_i). These latent variables represent the seven leadership archetypes listed earlier. As opposed to observed variables, latent variables can only be measured indirectly. For example, the latent variable “recruiter” (L_1 in Fig. 4) loads variables such as “team diversity” (the recruiter leader hires various profiles in the hope of enhancing the team's creative performance). Similarly, the motivator leader (L_7) will consider using incentives (observed variable “extrinsic motivation”) in the hope of enhancing the team's creative performance.

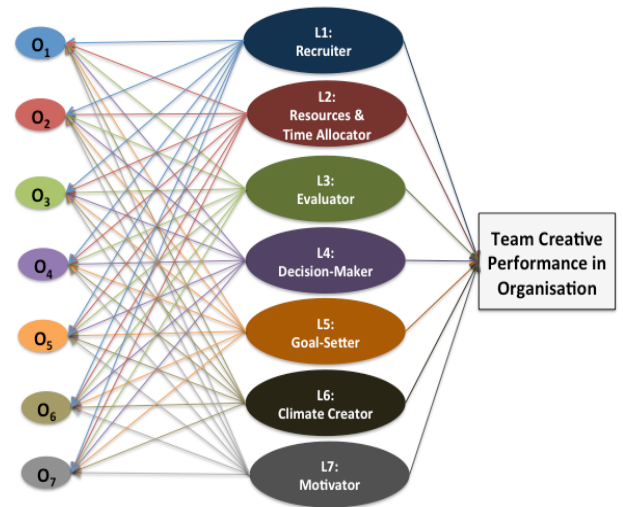


Fig. 4. Observed and latent leadership variables related to creative performance of teams in organizations

However, according to the cognitive rules of leadership for creativity, other observed variables, which are generally not considered in the leadership and creativity literature, may also follow these rules. In what follows, we attempt to shed light on these “other observed variables” (usually overlooked in the literature) for each archetype of leaders.

The archetype of recruiter

Recruitment is a principal human resource management function of leaders in organizations. It refers to the process of hiring candidates for specific jobs within an organization. If we explore the leader's role as a recruiter in an organization, we note that the literature has focused on the following associated observed variables:

- Team diversity (Bassett Jones, 2005, Cox et al., 1991): to achieve creative outcomes, leaders are more likely to recruit members from different areas to obtain new expertise for their teams. For example, some researchers have found that different ethnic groups can produce more creative ideas (Cox et al., 1991).
- Rich profiles: certain profiles are recognized as contributing to the success of creative efforts and are more predisposed to creativity than others. For instance, creative leaders are more likely to recruit “project champions” (Mumford et al., 2007): individuals with good network connections and credibility; experts (Stringer, 2000): individuals with past experience in the area where innovation is of concern; or creative thinkers (Zuckerman, 1979): individuals with high-level creative thinking skills.
- Salaries and rewarding contracts (Kachelmeier and Williamson, 2010): salaries and rewarding contracts are recognized as a good recruitment instrument that can be used by leaders to stimulate creativity among their teams. For example, leaders can offer their

future employees a system of “rewarding contracts” to encourage creative performance.

However, if we rethink the role of recruiters in accordance with the rules of step 2, we find new variables in the recruitment process that it may be necessary to consider: i) detect the current state (F/E type), and then ii) maintain the state if E or change the state if F.

In fact, few studies have shed light on the contractual relationship as an important factor in creativity (Lloréns Montes, 2004, Singh Panesar and Markeset, 2008). The contractual relationship can act as an efficient observed variable in relation to creativity in organizations. According to the rules of step 2, it can serve to manipulate the status of followers (maintain their state when defixated or change their state when fixated). For example, creative leaders such as Kodak’s Kenneth Mees (who co-developed the first panchromatic photographic plates) used “contractual relationship types” to manipulate the states of his collaborators (Le Guern, 2017). In the Kodachrome project, Mees proposed special contracts without any kind of formal subordination or hierarchy to two independent photochemists, Mannes and Godowsky, who undertook their first successful experiments even before their official collaboration with Kodak commenced. Indeed, Mees wanted to preserve their creative behaviour, and may have believed that their creative performance would have been hindered if they were employed under traditional contracts with standard leader/member subordination, whereas he continued to impose traditional contracts on his R&D team because he considered them less creative. Similarly, Google’s Larry Page or Sergey Brin, who believed in informality, used to hire very creative people and did not impose any formal subordination on them (Coget et al., 2014). Page and Brin may also have believed that this approach would preserve the creative behaviour of these people.

The archetype of resources and time allocator

Resource and time allocation involves using available organizational resources and time strategies to achieve specific organizational goals. Leaders play a crucial role in leveraging the organization’s resources to accomplish organizational goals. If we analyse the leaders’ role as resources and time allocators in organizations, we note that to enhance teams’ creative performance through the latent variable “resource and time allocation”, the literature emphasizes the following observed variables:

- Sufficient resources (Mumford et al., 2007, Makri and Scandura, 2010): to achieve creative outcomes, leaders should provide sufficient resources for their teams and avoid projects that suffer from inappropriate or inadequate resources. Indeed, to be creative, employees need access to appropriate resources.
- Appropriate timing strategies (Gruber and Davis, 1988): another factor that is recognized as supporting

creativity is the capacity of leaders to allocate sufficient time for innovative projects.

According to our rules, allowances (i.e. the degree of freedom) or constraints on resources and time can serve as a good observed variable in manipulating followers’ states of mind. The biography of Apple’s late founder Steve Jobs notes that he may have constrained time and resources in certain situations, imposing severe constraints and tight deadlines on his teams in an effort to force things to happen (Deutschman, 2001). Perhaps Jobs may have considered his teams to be in a state of fixation, and unable to come up with crazy and disruptive ideas or solutions to problems. If we analyse this possibility through the lens of our experiments, we could say that he was attempting to change the state of his followers from fixation to expansion.

On the contrary, Google’s Larry Page and Sergey Brin used to offer free time and extra resources to some of their staff members for “pet projects” (20 per cent of their working time) to allow them to pursue their own interests. In fact, Page knew there were creative people in the company that were capable of giving rise to great innovative projects, and wanted them to maintain their current state (considered expansion). AdSense, Gmail, Google Transit, Google News and Google Talk were all successful products and services that started as “pet projects” (Coget et al., 2014).

The archetype of evaluator

Evaluation is one of a leader’s systematic processes for obtaining information about the performance of a team. Some studies have shown that evaluation can have a negative effect on creativity by affecting motivation (Shalley and Gilson, 2004, Shalley and Oldham 1985), while others have found the opposite (Harackiewicz and Elliot, 1993). According to the literature review, the following observed variables are associated with “evaluation”:

- Constructive and developmental evaluation (Carson and Carson, 1993, Zhou, 2003, Zhou and Li, 2013): studies have stressed that leaders who provide negative and controlling evaluation feedback to their teams can hinder their creative performance. These studies argue that leaders who deliver constructive and developmental evaluation and feedback to their teams can enhance their creative performance.
- Exchange of evaluative information (DE Stobbeleir et al., 2008, De Stobbeleir et al., 2011): studies argue that the exchange of evaluative information enhances individuals’ creative performance.

According to the cognitive rules of leadership for creativity, one would think of new observed variables associated with the latent variable “evaluation”. In fact, recent cognitive studies have shown that “positive nudging” (labelling an uncreative team as being creative), or “negative nudging” (labelling a creative team as being uncreative) could both have interesting effects on

changing/maintaining individuals' states (Agogue et al., 2015). IDEO's David Kelley is known to encourage his team by offering positive remarks, even if his team is in difficulty. Again, if we analyse this fact from the perspective of our experiments, we could say that he is trying to change the state of his teams from fixation to expansion using positive nudging.

On the contrary, there is clear evidence in the Jobs biography that he was very demanding towards his team, to the extent of sometimes considering them as lacking creativity. We could imagine that he used negative nudging to preserve the "expansion" state of his teams and push the limits of individuals he considered creative (such as Steve Wozniak) to make innovative things happen.

The archetype of decision-maker

Decision-making is the process of making choices between two or more alternatives (which can take the form of creative ideas, financing options, or even a new branch location for a company). The decision-making function of leaders depends on the information obtained by their teams, as well as their cognitive ability to use this information to make appropriate decisions. When we examine the leader's role as a decision-maker in the organization in the literature, we once again find the following team creativity-supportive variables that serve to manipulate the latent variable "decision-making":

- Collective decision-making (Stasser and Birchmeier, 2003): group decision-making, as opposed to individual decision-making, is usually considered an efficient creativity-supportive variable for creative decision-making processes.
- Risk-taking in decision-making (Dewett, 2007): the encouragement by leaders of their teams to take risks is considered an important variable in relation to creativity in decision-making processes. Page and Kelley are known to exercise risk-based decision-making as part of their leadership style (Brandt, 2011). Indeed, they both used to encourage their subordinates to take risks, make mistakes, and try new and crazy ideas (Coget et al., 2014).

However, other observed variables such as the role of "committed non-decision-making" were ignored in the literature review, despite the fact that this could enable leaders to manipulate employees' states. We can describe "committed non-decision-making" as the act of deliberately suspending the decision-making process to search for more useful alternatives and opportunities than the currently available options (Chu and Hung, 2009, Nutt, 2004, Gregory et al., 2012, Keeney, 1994). Committed decision-making, as well as committed non-decision-making, can be used by leaders to maintain/change their followers' states. Jobs could be categorized as a committed non-decision-maker, because he would transform decision-making from convergent to divergent processes by challenging his teams to come up with more creative alternatives (Coget et al., 2014). On the contrary, Mees would be categorized as a committed

decision-maker, because he would make fast and radical decisions, such as the one to rebuild the Kodak research laboratories from scratch (Le Guern, 2017).

The archetype of goal-setter

Goal-setting is another classical leadership function in organizations, and refers to the process of specifying organizational targets, as well as the plan that is necessary to achieve them. According to the literature review, the following observed variables associated with the latent variable "goal-setting" are recognized as fostering creativity:

- Set creativity as a goal (Chua and Iyengar, 2008): one of the variables known to affect creativity is "setting creativity as a goal".
- Goal specificity and difficulty (Litchfield, 2009): studies show that the more specific, difficult and challenging the goal, the higher the creativity of individuals.

However, when we rethink goal-setting according to the rules of step 2, we highlight variables that enable leaders to switch followers' states from fixation to expansion and vice-versa. This variable consists of either specifying the goal or specifying what the goal is not. Indeed, leaders may sometimes specify what the objectives are not, instead of specifying what the objectives are, which may have a positive impact on creativity among their followers. Van de Ven et al. demonstrated that innovation is not necessarily planned and controlled around a well-specified goal (van de Ven et al., 2008).

The archetype of climate creator

If we analyse the leader's role as a climate creator in organizations, we again find in the literature review the following variables belonging to climate creation that are recognized as enhancing the creative performance of individuals:

- Creativity-supportive climate and culture of innovation (Tesluk et al., 1997): studies show that leaders providing a creativity-supportive climate and promoting a culture of innovation in their companies are more likely to achieve successful innovations.
- Play and serious play (Heracleous and Jacobs, 2008): studies found that play, and serious play, could also serve as an interesting climate creation tool to stimulate employees' creativity in organizations. In fact, having fun engages creativity and has been found to increase creative thinking skills, such as the Kelley method of "rush to prototype" (Kelley, 2001).

According to the rules of step 2, observed variables such as maintaining an open and relaxed environment versus creating a closed and stressful organizational climate could switch the state of followers from fixation to expansion. Steve Jobs, for instance, used to create a stressful, judgment-based environment in which Apple employees felt judged and insecure. Nonetheless, it is

worth pointing out that he also created a culture of pirates, along with a specific pirate flag to change the organizational climate by introducing an element of playfulness (Imbimbo, 2009). In contrast, Google's CEO maintained a relaxed and open Googleplex environment to enable employees to informally collaborate and exchange ideas (Coget et al., 2014).

The archetype of motivator

Finally, motivation is a crucial leadership function in management, and refers to the capacity of leaders to create a willingness amongst staff to perform to the best of their ability. If we examine the leader's role as a motivator in organizations, we again find the following classical observed variables:

- Intrinsic motivation (Amabile, 1998): findings suggest that intrinsic motivation is one of the principal factors affecting employees' creativity in organizations.
- Extrinsic motivation (Mumford and Hunter, 2005): similarly, other studies have found that extrinsic motivation (such as incentives and rewards) can play

a crucial role in fostering teams' creative performance in organizations.

However, few studies have emphasized variables such as the act of combining motivation and demotivation for creativity. In fact, most studies have focused on motivating people to enhance their creativity. However, the rules of step 2 also emphasize demotivation as a tool to handle individuals' states. For example, Steve Jobs used a demotivating behaviour style in many situations with his teams (Coget et al., 2014). Nevertheless, this demotivating style did not prevent his teams from achieving creative outcomes.

Table 3 summarizes each of the seven archetypes of leaders in organizations (latent variables), along with the most classical variables (observed variables) belonging to each archetype according to the leadership and creativity literature, and then presents the relevant observed variables that were uncovered by the leadership defixation rules, with an example of how the variable is executed (A then B1 or B2) using biographies of five famous innovative leaders.

Table 3. Relevant observed variables for leadership defixation in organizational contexts

Latent Variables (LV): Leaders' Archetypes	Observed Variables (OV): Leadership and Creativity Literature	Relevant OV according to the "Cognitive Rules of Leadership for Creativity"	(A) Leader Detects Team/Task state: "Fixation"/"Expansion"	
			If state = "Expansion" → then (B1): Leader "Maintains state"	If state = "Fixation" → then (B2): Leader "Changes state"
Recruiter	- Team diversity - Rich profiles (expertise, project champions, creative thinkers) - Salaries and rewarding contracts	- Design jobs according to the candidate's level of creativity - Contractual relationship with/without subordination	(A): As recruiters, leaders could design jobs according to the creativity level required by the candidates to perform the job and therefore detect their appropriateness for the job. (B1): New types of leader/member contractual relationships to avoid any kind of subordination, such as the relationship between Kenneth Mees and the photochemists Mannes and Godowsky in the Kodachrome project at Kodak (Le Guern, 2017).	(B2): Traditional type of contractual relationship with standard subordination, such as the relationship between Kenneth Mees and his R&D team at Kodak (who were considered less creative) (Le Guern, 2017).
Resources and Time Allocator	- Sufficient resources (appropriate resource allocations) - Appropriate time strategies	- Regulation of Resources and Time Allocation according to creativity projects - Resources and Time Allowances/Constraints	(A): As resources and time allocators, leaders could regulate resources and time allocations according to the level of creativity required to accomplish the project. (B1): Resources and time allowances: Provide extra resources and time for creative behaviour persistence, such as "20 per cent of working time" for "pet projects" by Larry Page or Sergey Brin at Google (Goffee and Jones, 2007).	(B2): Impose resources and time constraints, such as Google's innovation principle "Creativity loves constraint" by vice president of search products and user experience Marissa Mayer (Dyer et al., 2009).
Evaluator	- Constructive and developmental evaluation - Exchange of evaluative information	- Creativity measurement tests - Positive/Negative Nudging	(A): As evaluators, leaders could detect the state of their followers (fixation/expansion) using creativity measurement tests to identify the fixation level of their teams for a particular project. (B1): Positive nudging by labelling people as being very creative, such as David Kelley's nudging behaviour towards his team at IDEO (Kelley and Kelley, 2013).	(B2): Negative nudging that pushes the limits of teams, such as Steve Jobs' attitude towards his team at Apple (Elliot and Simon, 2011).
Decision-maker	- Collective decision-making - Risk-taking in decision-making	- Resistance to radical decisions - Committed decision-making and committed non-decision-making	(A): As decision-makers, leaders could detect whether their teams are fixated or defixated on a specific project by considering their resistance to radical decisions. (B1): Committed non-decision-making: not making decisions but pushing teams to create new alternatives or decision opportunities. Steve Jobs' highly critical decision-making style was useful in forcing his teams to create better alternatives (Coget et al., 2014).	(B2): Committed decision-making: making radical decisions that invoke changes (e.g. restructure a research team from scratch), such as Kenneth Mees' total restructure of Kodak Research Laboratories (Le Guern, 2017).
Goal-Setter	- Set creativity as a goal - Specific and difficult goals	- Set ambiguous goals - Remind staff of what the goal is or what the goal is not	(A): As goal-setters, leaders could set ambiguous goals for their teams and then distinguish how individuals adapt themselves creatively in response to these goals. (B1): Remind the team of the goals of the organizations. Larry Page is an example of a leader who had a great ability to remind his team of the goals of the organization.	(B2): Specify what the goal is not, and what the objectives are not (used in relation to uncreative teams).
Climate Creator	- Creativity-supportive climate and culture of innovation - Play and serious play	- Comfort levels in varied environments - Open and relaxed versus closed and stressful climate	(A): As climate creators, leaders could differentiate fixated/defixated members in their teams according to their levels of comfort in various environments (e.g. bureaucratic, stable, unstable). (B1): Maintain a relaxed and open climate and culture: Google's CEO maintained a Googleplex climate inside Google headquarters to enable his employees to informally collaborate together in a friendly and relaxed social environment (Coget et al., 2014).	(B2): Create a close and stressful organizational environment such as Steve Jobs' work climate at Apple, in which employees felt judged and insecure (Imbimbo, 2009).

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Motivator	- Intrinsic motivation - Extrinsic motivation (e.g. rewards and incentives)	- Willingness to perform creative tasks - Activate motivation or deactivate it (demotivate)	(A): As motivators, leaders could distinguish between fixated and defixated individuals based on their willingness to perform creative tasks.	
			(B1): Motivate the team with facilitative behaviour, encouragement and a push-forward style, as used by leaders such as Larry Page/Sergey Brin at Google (Vise, 2007) or IDEO's David Kelley (Kelley and Kelley, 2013).	(B2): Demotivate the team with demanding behaviour and a push-back style, as used by leaders such as Steve Jobs at Apple (Kothari, 2010).

DISCUSSION AND CONCLUSIONS

We introduced a research method to link laboratory research settings with real-life organizational settings in the area of “leadership for creativity”. This research method includes:

- Step 1: Neutralize the organizational variables that could interfere with defixation.
- Step 2: Generate “cognitive rules of leadership for creativity” based on controlled lab experiments.
- Step 3: Extend the rules of step 2 to organizations.

Using this research method, we were able to uncover new organizational leadership variables for promoting creativity that were usually not considered in the list of relevant variables relating to creativity in organizations. This list of newly observed variables included *contractual relationship type with or without subordination, resources and time allocation with allowances or constraints, positive or negative nudging, committed or non-committed decision-making, specifying what the goal is or what the goal is not, creating an open and relaxed versus a closed and stressful climate, and motivating or demotivating teams.*

We illustrated why these newly observed variables, which are usually not considered by the literature, are useful and could not be excluded using a set of historical and empirical materials that comprised rich data extracted from biographies of 5 famous innovative leaders: Steve Jobs, Kenneth Mees, Larry Page, Sergey Brin and David Kelley, as well as empirical studies in the literature on leadership for creativity.

These findings provide new insights into the ways in which leaders can help to mitigate fixation and foster creativity in organizations through recruitment, motivation, decision-making, evaluation, goal-setting, resource and time allocation, and climate creation. These are new perspectives that can be obtained from our lab experiments. However, it is important to point out that these findings are just the first step towards better understanding the roles of leaders in promoting creativity inside organizations.

For this reason, the research method presented in this paper should open the way to future experimental studies, as well as more empirical studies, to test the effects of these newly uncovered variables affecting creativity. These future experiments could, for instance, be done under the framework of CERN in IdeaSquare-Challenge based Innovation (CBI) courses to see how CBI coordinators playing a leadership role could defixate their students to produce new and innovative concepts

for societal applications (Kurikka et al., 2016). It is worth mentioning that these future experiments should also help to reveal new and relevant leadership variables for creativity that could not have been discovered through lab experiments.

ACKNOWLEDGEMENT

We thank Geoff Whyte, MBA, from Edanz Group (www.edanzediting.com/ac) for editing a draft of this manuscript.

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